Remarks

The interview granted on January 9, 2008 to the undersigned and David A. Olson, one of the inventors for the subject invention, is acknowledged with appreciation. The Interview Summary record accurately summarizes the interview.

The reasons discussed at the interview for patentability of applicants' invention are here formally submitted. In addition the claims have been amended to emphasize distinctions of applicants' invention over the known prior art. It is believed this application is in condition for allowance, and a notice to that effect is earnestly requested.

I. Applicants have achieved an unexpected, long-sought result not obvious from Buntin

A. Applicants' claimed method provides webs that have a dramatically new and superior dimensional stability

Two samples of meltblown polyethylene terephthalate (PET) microfiber webs were exhibited at the interview. Both samples had been subjected to the same standard dimensional stability test (described in applicants' specification, page 16, first paragraph). One sample was a conventional commercial meltblown PET microfiber web, and the other was a web of applicants' invention. Each sample had been 5-1/4-inch in diameter before the test (the commercial sample was thinner than the sample of applicants' invention, but that does not change the essential result of the test). The conventional commercial sample had badly shrunk in the test, to a fraction of its original diameter, and had become badly embrittled to the extent that it cracks during moderate handling. Such shrinkage and embrittlement is the routine result when conventional meltblown PET webs are subjected to a shrinkage test.

By contrast, as seen from the test sample of applicants' web shown at the interview, a web of applicants' invention retains its original dimensions and flexibility during the shrinkage test. To applicants' knowledge, no prior meltblown PET microfiber web has ever exhibited the dimensional stability and continued flexibility and durability exhibited by webs of applicants' invention.

B. The shrunken sample of commercial PET web illustrates a long-standing problem

The inability of prior-art meltblown PET microfiber webs to withstand elevated temperatures, as indicated by the severe shrinkage of the exhibited commercial PET web, is a long-standing deficiency. Many efforts have been made to overcome this

deficiency, some of which are listed in applicants' specification, on page 1 through page 3, line 21. Despite these efforts, the problem continues, as illustrated by the shrunken commercial product.

C. Buntin, issued in 1974, did not solve the dimensional instability problem of meltblown PET microfiber webs

Buntin, U.S. Patent No. 3,849,241, has nothing to say about dimensionally stable meltblown PET microfiber webs. Instead, Buntin's aim is to degrade polymers. Moreover, applicants achieve dimensional stability by imparting chain-extended crystallization to the fibers, and Buntin says nothing about chain-extended crystallization.

Buntin has been available to the nonwovens industry since its issuance in 1974. Prior workers have worked to overcome the lack of dimensional stability of meltblown PET microfiber webs over a significant part of the time since 1974, as indicated by the listed efforts in applicants' specification. Despite the availability of Buntin and the eagerness to obtain dimensional stability, no prior worker skilled in the meltblowing art found the answer to that lack of dimensional instability in Buntin. This is strong evidence that applicants' invention is not taught in, or obvious from, Buntin.

II. Applicants achieve their unexpected result with a combination of steps not taught in Buntin

As recited in their claims, applicants achieve dimensionally stable meltblown PET microfiber webs by a combination of steps:

a) extruding molten PET polymer at a low extrusion temperature (less than 295 °C in claim 1 and preferably less than 285 °C or 275 °C, as recited in claims 5 and 6),

b) extruding the molten PET polymer into a stream of air that has a low temperature (260 °C or less in claim 1 and 270 °C or less in claim 5) and a high velocity, and

c) imparting "chain-extended crystallization to the PET fibers."

Buntin does not teach such a combination of steps: Buntin lacks any specific teachings about PET; Buntin does not teach imparting chain-extended crystallization to meltblown PET fibers; Buntin does not teach the particular temperature parameters used by applicants for PET; and Buntin's guiding aim is elevated-temperature heating to degrade a polymer instead of applicants' low-temperature extrusion of PET to impart

chain-extended crystallization No skilled reader would learn of applicants' invention from Buntin.

A. Buntin lacks necessary teachings about an extrusion/degradation temperature for PET

Buntin's basic teaching about degrading a polymer is found in column 3, lines 36-46. The key part of the passage is quoted below, in a subdivided form to emphasize the different parts of the teaching:

> i) Temperatures well above the melting point of the polymer are employed.
>
> ii) In the absence of free radical source compounds ... the high intrinsic viscosity resin suitably is subjected to a temperature within the range of from about 550° F. [about 288 ° C] to about 900° F., preferably from about 600° F. to 750° about F.,
>
> iii) for a period of time effective to cause the requisite extent of polymer degradation ... .

Coupled with the above passage is another passage in Buntin, at column 4, lines 34-42, where Buntin broadly describes the polymers that may be used in his invention, stating:

> The degraded fiber-forming thermoplastic resin ... is produced ... from thermoplastic polymer resins that are degradable ..., including polyamides, e.g., ... ; polyesters, e.g., poly(methymethacrylate) and poly(ethyleneterephthalate); polyvinyls, e.g., ... ; C3-C8 polyolefins, high density polyethylene, and mixtures thereof.

1. Buntin's teachings about PET are incomplete without a description of particular temperatures to be used with PET

The temperature range, 550°F to 900°F, described in the first-quoted passage above, is understood to broadly describe a wide range of temperatures "within" which, according to Buntin, there is some unspecified temperature at which polymers listed in the second-quoted passage can be heated to degrade them. The broad range 550°F to 900°F is only a start in knowing the temperature for treating a particular polymer. Other factors must also be considered. For example, Buntin states in section (i) of the passage quoted above that the temperature used must be "well above the melting point" of the polymer in question. But how much "above" is unstated.

Buntin recognizes the incompleteness of his teaching, and proposes a test to determine the useful temperature in column 9, lines 13-40. By stating this test, Buntin is explicitly stating that the broad temperature range 550°F to 900°F is not useful with all polymers, and further information must be developed. Specifically, Buntin is stating that further information must be developed before it will be known what if any temperature is useful with PET.

2. Buntin does not describe particular extrusion temperatures for use with PET

Buntin does not state what temperatures should be used with PET. The one-word mention of polyethylene terephthalate (PET) in the just-quoted disclosure is the only mention of PET in the whole 26-column patent.

Assuming PET has any utility in Buntin's invention, which is unproven and not demonstrated by Buntin (illustrated in Section III below), the full range of conditions taught by Buntin would not be applicable with PET. But a reader does not know what conditions are applicable to PET. Assuming that it would be at all desirable and possible to practice Buntin's invention on PET, a skilled worker would need to experiment to develop the conditions for such practice.

B. Buntin's teaching about air temperature is similarly broad with no specific teachings about PET

Buntin's teaching about the second of applicants' combination of steps, namely the temperature of the air into which polymer is extruded and drawn, is found at column 7, lines 59-63:

> The air temperatures may vary from 500 ° to 900 °F. Generally the air temperatures are within the same temperature range as the nozzle die temperatures. Usually the air temperatures are slightly higher, about 50 °F., than nozzle die temperatures.

As seen, Buntin is again stating a broad range intended to apply to the whole broad group of polymers listed in his specification. A skilled worker would again understand that not all temperatures are applicable to all polymers. For example, Buntin uses only air temperatures of 510°F to 707°F for polypropylene, less than half the broad 500°F-to-900°F temperature range taught by Buntin as applicable to all his contemplated polymers.

Buntin never says what air temperature would be used for PET.

C. Buntin does not teach applicants' combination of steps

1. The need to select two temperature parameters – extrusion temperature and air temperature – makes Buntin even more remote from applicants' invention

Buntin has no specific teaching about an extrusion temperature for PET, and no specific teaching about an air temperature for PET; but even more than that, Buntin has no teaching about a specific combination of extrusion temperature and air temperature to be used with PET. The rejection chooses two boundary conditions – the very extreme low-end temperature of Buntin's range of air temperatures, combined with the low-end temperature of Buntin's range of extrusion temperatures --, and applies them to PET. There is no teaching in Buntin of such a combination of steps for PET, and it seems clear that the only guide for selecting this combination is applicants' own teachings. It may be noted that the 550°F extrusion temperature and 500°F air temperature asserted in the rejection are never actually used by Buntin in his working examples or elsewhere. Nor does Buntin use such temperatures with any other polymer, including PET.

2. Buntin does not anticipate or suggest applicants' step "to impart chain-extended crystallization to the PET fibers"

Applicants operate their meltblowing process to impart chain-extended crystallization to the meltblown fibers. This is a new step in PET meltblowing processes. Applicants teach and exemplify this step with numerous examples in their specification. Persons skilled in the art are taught by applicants' teachings to impart chain-extended crystallization to the fibers, and they are given guidelines of extrusion temperatures, air temperatures and fiber velocities to accomplish such chain-extended crystallization.

Buntin has no teaching of applicants' new step. Instead Buntin operates his process to degrade the polymer being treated. Buntin heats the polymer being treated to a temperature well above the polymer's melting point "for a period of time effective to cause" polymer degradation (Buntin, column 3, lines 42-44). A skilled reader of Buntin would receive no understanding of applicants' step of imparting chain-extended crystallization to meltblown PET fibers.

3. Applicants' combination of steps achieves an unexpected result

By their claimed combination of steps, applicants achieve an important new result, namely, dimensional stability in a web of meltblown PET fibers. This is an unexpected result – the solution to a long-standing problem, and it is achieved with a particular combination of steps not taught in Buntin.

As demonstrated by the examples of tested webs shown at the interview, the result achieved by applicants is dramatically superior to the performance of conventional meltblown PET microfiber webs. Persons skilled in the art have sought to achieve such a result for many years, without success. Applicants have found, and teach, a new combination of steps that achieves this unique result, and neither the result nor the combination of steps is taught by Buntin.

III. Buntin is irrelevant to the PET used in applicants' claimed process

Buntin states that his discovery is to degrade polymer resins that "have high intrinsic viscosities (at least about 1.4)"; see Buntin, column 2, lines 36-43, emphasis added. See also the Buntin Abstract; the rest of column 2, to line 58; column 4, lines 20-25; column 4, lines 42-49; and column 7, lines 14-18.

The attached excerpt from the *Handbook of Thermal Elastomers* states that PET is commercially available and generally used with intrinsic viscosities of from about 0.4 to 1.0. The varieties listed include fiber-grade PET, i.e., a PET useful in making meltblown fibers, the subject of applicants' invention.

Thus, in addition to the reasons stated above, Buntin has no application to the PET called for in applicants' claims, because such PET does not require the degradation that is Buntin's sole purpose. Persons skilled in the meltblowing art, interested in making meltblown PET microfiber webs, would not follow Buntin's teachings, because in addition to the reasons stated above there is no reason to degrade PET.

Further, degradation of PET would introduce completely new issues that are not in any way discussed or taken into account by Buntin. For example, degradation of PET would create new chemical species – quite different from anything created by degradation of polypropylene -- which could be quite undesirable.

The above facts illustrate the deficiencies of Buntin as a teaching having anything to do with PET. The PTO *Manual of Patent Examining Procedure* states that a prior-art reference must have an enabling teaching as to the asserted subject matter

(MPEP 2121), and Buntin has no such teaching. Buntin has no specific teachings about PET, and the above problems with PET are just an illustration of the fact that Buntin's teachings are inapt and nonenabling as to PET.

IV. Specific discussion of rejections

The rejections stated against applicants' claims depend on the correctness of four propositions, which are contemplated in the rejections stated in the Office action (see page 2 of the Office action, last full paragraph, through page 3 for the base rejection; the remaining rejections are all understood to rely on the base position stated in the identified paragraphs on pages 2 and 3). The four propositions, all of which must be correct if the rejection is correct, are:

1. Buntin teaches making melt blown non-woven webs by extruding PET at a temperature of 550°F (288°C); and

2. Treatment of PET at a temperature of 550°F satisfies Buntin's requirement that the treatment temperature be "well above the melting point": and

3. Buntin teaches processing extruded PET with a stream of air at 500°F (260°C); and

4. Buntin teaches operating his process to impart chain-extended crystallization to meltblown PET fibers.

For the reasons discussed above, it is submitted that each of the above propositions is incorrect. Specifically:

1. Buntin does not teach extruding PET at a temperature of 550°F, because Buntin does not teach any specific extrusion temperature for PET;

2. Buntin does not teach that 550°F is well above the melting point of PET – "well above" is undefined and must be determined by testing;

3. Buntin does not teach processing extruded PET fibers with air at 500°F, because Buntin does not teach any specific air temperature for PET; and

4. Buntin does not impart chain-extended crystallization to meltblown PET fibers.

Not only are each of the propositions incorrect in themselves, the combination of propositions is also incorrect.

Beyond the described void in Buntin's teaching, applicants' invention is seen to be nonobvious because it achieves an unexpected result – the solution of a problem that has existed throughout the previous history of meltblown PET microfibers. Applicants

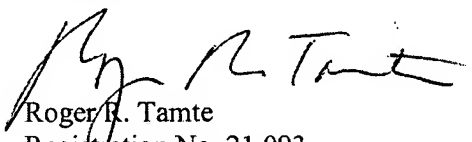
achieve this result with a combination of steps not taught by Buntin. Applicants have made an invention that is not found in Buntin and not obvious from Buntin. Accordingly, it is submitted that each of the stated rejections should be withdrawn.

V. Claim amendments

Claims 1 and 5 have been amended by adding after the recitation "sufficient to impart chain-extended crystallization" the words "and thereby provide dimensional stability to a web of the fibers." The added words are supported among other places in the paragraph of applicants' specification bridging pages 3 and 4. The recitation of chain-extended crystallization and dimensional stability directs applicants' claims to subject matter long sought and never before attained, emphasizing its remoteness from the teachings of Buntin.

All outstanding objections and rejections are believed to have been met and overcome. If a telephonic conference with Applicants' undersigned representative would be useful in advancing the prosecution of the present application, the Examiner is invited to contact the undersigned at (651) 733-1520. A notice of allowance for all pending claims is respectfully solicited.

Respectfully submitted,



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